OPTIC NEURITIS ASSOCIATED WITH DISEASE OF THE SINUSES ACCESSORY TO THE NOSE[1]

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A most important advance in our understanding of the etiology and nature of a considerable group of obscure ocular affections has been set forth during recent years, in a rapidly growing literature covering the border lines of three important and highly specialized fields in medicine and surgery, viz., neurology, oto-rhinology and ophthalmology. It is my purpose in presenting the following case histories to emphasize the relationship which may exist between certain forms of eye disease and affections of the bony sinuses in the anterior segment of the skull, contiguous to the orbits and accessory to the nasal fossæ ; and furthermore to show that the accompanying symptom complex may suggest, even to the astute and experienced observer, serious intracranial disease.

Great liability to disease of the nasal fossæ and the accessory sinuses not infrequently results from congenital malformations in the anterior portion of the skull. The form of the orbits, the relation of parts in the nostrils, and in the contiguous sinuses are unquestionably modified by the distortions of the skull. It is not unusual to find a deflected bony septum in the nose and one or both middle turbinates tightly wedged between it and the outer bony wall. This limits the breathing space. In such persons, the slightest turgescence of the soft tissues effectually prevents the normal drainage from one or more of the accessory sinuses. Many clinical examples could be brought forward to demonstrate the signal importance of these congenital defects causing both ocular and rhinologic disturbance. We are all familiar with the distressing symptom-complex attending upon an acute coryza. For example inability to use the eyes comfortably, the increased lachrymation, the photophobia and frontal pain.

Ophthalmoscopic study of the fundus at such time shows a marked hyperemia ; not infrequently a uniform fluffy appearance of the eye ground and a cherry red optic disc.

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[1] Presented by invitation to the Philadelphia Neurological Society, January 22, 1909.

The picture is most suggestive of the possible pathologic ocular states which may arise when more or less permanent sinus disease exists, with the ever present tendency to acute exacerbations. In this connection the very intimate anatomic relations between the nasal fossæ and the accessory sinuses should be borne in mind. The mucous membrane lining the interior of the nose is continuous through narrow drainage canals with the "muco-periosteum" lining all of the sinuses. These bony walled cells are therefore likely to participate in the infectious diseases of the nasal membrane. When this occurs their anatomical situation is peculiarly unfortunate, since the closure of their ducts by inflammatory thickening of their lining membrane and by the turgescence and hypertrophy of the soft tissues in the nose effectually prevents normal drainage. The resulting pressure by the pent-up secretions is a frequent cause of headache and favors the extension of the disease to contiguous structures. To comprehend what may ensue we have but to recall the anatomic relations of the inflamed membrane lining the thin bony walls of these cavaties to the important structures lying in contact, or in close contiguity. The danger to the integrity of the eye becomes apparent, especially in the case of the sphenoidal sinus with the chiasm and the optic nerves in such close proximity, the former resting upon its roof and the latter coursing along its paper-like walls to reach the optic foramen. In the case of the other sinuses one has but to study the thinness of their walls, the frequent lapses in their continuity; the network of sutures which in adult life unite the different centers of ossification ; the numerous foramina for the passage of nerves, arteries, veins and lymph channels, to realize the opportunities which are afforded for the ready migration of infectious products to the orbital tissue.

Since the walls of these sinuses form so large a part of the walls of the orbit, reasoning *a priori,* it is not cause for surprise that the contents of the orbit are peculiarly liable to invasion, as has been so abundantly proven by comparatively recently published observations and clinical reports. It is, however, a cause for surprise that the frequency of its occurrence, and its serious significance in ocular affections was not sooner, and certainly more generally recognized. It is true that we have not been unmindful of the fact that disease of the ethmoidal cells was the *fons et origo* of orbital abscess ; that malignant disease of the maxillary sinus or of the ethmoidal cells was especially prone to invade the orbit, but I am convinced that, so far as the literature affords an indication, we have not appraised at its full value the responsible part played by affections of these cavities in the production of ocular discomfort and ocular disease.

More or less serious and obscure ocular disease has, I am sure, in some instances been ascribed erroneously to more remote causes; or a rebellious asthenopia, which would not be vanquished by the correction of an error of refraction or some muscular imbalance, has been laid at the door of neurasthenia, toxemias, or other causes when the real origin of the trouble was to be found in some affection of one or more of these bony walled cells. It may often be nothing more serious than pressure, *e. g.*, in a frontal sinus or the anterior ethmoidal cells due to a blocking or closure of the drainage outlet by a so-called "chronic cold in the head," which, when investigated, proved to be due to an acute swelling or a chronic hypertrophy of the nasal mucous membrane in the middle fossæ of the nasal chamber, or to some mild chronic sinusitis, probably the persisting result of some ante-dating infection.

The first case presented to illustrate the foregoing remarks is one of optic neuritis with great swelling of the papilla, lowered sharpness of vision and contracted fields, but the general symptom complex did not suggest intracranial origin. Events seem to have succeeded each other in the following order :

Firm blocking of the right upper nasal fossa by hypertrophy of the middle turbinate; purulent inflammation of the right frontal sinus; filtration into right maxillary antrum, necrosis and destruction of the floor of the frontal sinus, abscess of the orbit; proptosis of the eyeball; optic neuritis with reduction of vision to one fifth. Recovery through surgical procedure.[2]

Mr. M., age 47, consulted me August 5, 1903, for confusion of sight, and right hemicrania, which radiated from the midfrontal region to the right ear and occiput. There was slight puffiness of the right upper eyelid, the ball was proptosed forward, downward and outward, but the field of forced fixation was but little disturbed, except upward where it was limited to the horizontal line. Deep palpation under the orbital rim revealed only a soft fullness, leaving the impression of displaced orbital fat, but no nodular masses were discoverable. The movements of the left eye were normal, and both pupils reacted normally to light and shade. The field of vision was not impaired, there was no scotoma. V. = $\frac{6}{7}$–$\frac{1}{2}$ in each eye. There was a low grade of hypermetropic astigmatism in both eyes. In the position of rest the proptosed ball was estimated as 1 cm. in front of its fellow, and the center of the pupil 8 mm. lower. On everting the upper lid, the retrotarsal fold came forward, and there was moderate chemosis of the conjunctiva. Firm pressure upon the ball through the closed lids reduced the exophthalmos, increased the periorbital pain, and caused a painful sense of fullness or pressure in the right nostril. The ophthalmoscope showed no change in the caliber of the blood vessels, but the disk was grayish-red, opaque, and its margin obscured, while the entire fundus was a fluffy, homogeneous dark red color. A study of the nostrils showed the left nearly normal, but the right was stuffed with polypoid masses, which bled freely. A portion of this tissue was removed, sent to the laboratory for examination, and reported as malignant, but a second examination did not confirm this opinion. Transillumination showed that both the frontal sinus and the maxillary antrum on the right side were blocked by opaque contents.

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[2] Vide Transactions of the American Ophthalmological Society, 1908.

After consultation with Dr. G. E. deSchweinitz and Dr. B. A. Randall, it was decided to attempt the drainage of the frontal sinus and antrum through the nostril before adopting a more radical procedure. At my request Dr. Randall amputated the middle turbinate and enlarged the opening into the maxillary antrum. A canula was then introduced into each sinus daily, and large quantities, at first of semi-inspissated pus washed into the nostril. The proptosis of the eye-ball was greatly diminished by this procedure, and the pain became less severe, but both the pain and prominence of the ball recurred after any neglect of the troublesome and painful irrigation. After several weeks, vision sank to one fifth in the right eye, the optic nerve margins were entirely obscured, the veins were full, dark and tortuous and the summit could be seen with + 4 D.

He was then admitted to the Polyclinic Hospital, and assisted by Dr. Randall, the frontal sinus and anterior ethmoidal cells were freely opened through an incision under the orbital rim extending from a point under the middle of the eyebrow inward to the nasal bone, and downward along its border. On attempting to separate the periosteum the floor of the frontal sinus was found necrosed, and was curetted away.

There was a profuse gush of foul, purulent contents which was found to fill not only the entire sinus, but the orbit back of the eye-ball. The cavity after a painstaking removal of the diseased bone and granulation tissue, was carefully and thoroughly cleansed by irrigation with bichloride solution and diluted peroxide of hydrogen, followed by warm physiologic salt solution. A drainage tube was inserted in the frontal sinus, and a second into the nostril from the inner angle of the incision, and the wound closed.

The pain and proptosis promptly disappeared, and convalescence progressed uninterruptedly. The neuritis slowly subsided and vision rose to normal. Notwithstanding the displacement of the trochlear attachment of the superior oblique during the operation, normal binocular balance was restored.

Up to the present time, there has been no relapse. Vision with correcting glass was six fifths in each eye, and there was no remaining signs of the optic neuritis. There was orthophoria. There was no visible scar remaining from the operation except at the point of emergence of the drainage tubes, and as this was under the nasal end of the brow, could be seen only when the head was tilted backward. This emphasizes an important point in the technique of the operation for opening the frontal sinus. The incision under the orbital rim gives equal if not readier access to the sinus, secures more favorable drainage, and does not result in the deforming scar so often seen when the operation has been made above the rim of the orbit.

That serious optic neuritis associated with a symptom complex suggesting intracranial disease may find its origin in an unsuspected sinusitis is demonstrated by the history of the following case:

Case II.—Double optic neuritis; impaired central vision, contracted field; recovery after drainage of frontal and ethmoidal sinuses after duration of nearly three years.[3]

Thos. C., age 40, was sent to my clinic at the Wills Hospital, May 26, 1905, by his physician, Dr. Fetterolf. He had been suffering from insomnia and faulty vision, with frequent exacerbations of greatly increased but transient impairment of sight. At his first visit V. = $6/10$ in the right eye and $6/6$ in the left. The ophthalmoscope showed H. = 2 D. at the fovea in each eye, but the papillæ were swollen, and the margins of the disks hidden by the infiltrated overlying tissues. There were numerous flame-shaped hemorrhages on each nerve and throughout the fundus. The summit of the nerve was + 6 in the right eye and + 4 in the left.

The fields of vision were concentrically contracted to approximately 40° but no scotoma could be demonstrated. The urine was normal. The man's mother had diabetes, but otherwise the family history was good. He had never had gonorrhea or syphilis. The patient was sent to Dr. Weisenburg, then consulting neurologist to the hospital, for consultation. After an elaborate and painstaking study, Dr. Weisenburg reported the neurologic examination as negative with the exception of a general increase in the tendon reflexes. There was "entire absence of focal symptoms, and of general pressure phenomena." But, nevertheless, he advised that the skull should be trephined because of the great swelling of the optic nerves, and for the reason that "a new growth might be present in the cranial cavity in a region such as would not give any definite focal symptoms."

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[3] Vide Transactions of the American Ophthalmological Society, 1908.

The man would not consent to this, and the operation was not strongly urged. Even though there was no cause to suspect specific infection, large doses of potassium iodide, mixed treatment and mercurial inunctions to the point of commencing ptyalism were at different times persistently employed for many months with varying results. For a series of weeks the subjective symptoms would subside, the retinal hemorrhages absorb, and the swelling of the papillæ diminish, and a partial, or at times a nearly complete restoration of the fields of vision, so that on several occasions the man returned to his employment, the care of a stationary engine, only to suffer a recrudescence of the entire symptom complex. He had from the first complained of difficulty in breathing, especially at night, but on March 9, 1907, after a particularly bad and sleepless night, he came to my private office complaining of frontal pain. I then found a fresh crop of hemorrhages in the retina, and observed his great difficulty in breathing. The nostrils were then examined and both middle turbinates were found hypertrophied, and polypoid masses filling tightly the upper nasal space on both sides. The stiffening of the upper nasal fossæ was so complete as to effectually prevent all drainage from the accessory sinuses. I then amputated the middle turbinate on the right side, and two weeks later the same operation was performed on the left nostril. This was nearly two years after his first visit to the clinic, during which time he had been constantly under observation and treatment by his physicians, Dr. Fetterolf, Dr. Weisenburg and myself or my assistants.

The relief which followed these operations was phenomenal. The drainage from the frontal and ethmoidal cells was free, and at first profuse, consisting of a creamy white discharge. Irrigation was not adopted as it seemed unnecessary. The distress in the frontal region disappeared and he slept well. Vision rose to $^6/_6$ in each eye, and on April 20th, one month after the operations, the fields of vision were normal, and have remained so to date of writing, January, 1909. The swelling of the papillæ has slowly diminished, notwithstanding his continuous occupation at his engine. At the present time the swelling of both papillæ has entirely disappeared, the fields of vision are normal, and the patient entirely comfortable. $V. = {}^6/_{\mathrm{v}}$ in each eye. The nerve margins are seen indistinctly through the long time infiltrated overlying tissue. There has been no return of the hemorrhages. I can now but feel that the long delay, two years, before a study of sinus conditions was made, is a just cause for self reproach.

Case III.—Mr. D., age 58. A robust, healthy man consulted me December 12, 1905, for failing vision in the left eye. The right had been useless from childhood from amblyopia, due to convergent strabismus and high hypermetropic astigmatism. He had been told by an Italian surgeon many years before that restoration of vision was not to be hoped for. The opinion was doubtless based upon the theory of amblyopia from disuse. The left eye was then healthy and no treatment advised.

Examination showed the right eye not only amblyopic but totally blind from atrophy of the optic nerve. Left eye $V. = {}^6/_{60}$; the field of vision concentrically contracted to 30°. The nerve was gray-red, opaque, and margins obscured. The central vessels of the retina were normal in size. He suffered from fronto-occipital pain and insomnia. He was much addicted to the pleasures of the table and suffered attacks of gout. Frequent examination of the urine showed absence of albumin, or sugar, but high specific gravity and excessive deposits of uric acid, urates, etc. Transillumination showed both frontal sinuses opaque and the upper nasal fossæ were stuffed with huge polypoid masses on both sides but the right nostril was completely blocked.

These were removed with the snare and their removal was followed by large quantities of yellowish, creamy discharge. Amputation of the middle turbinate was advised but the operation refused by Mr. D. Great relief followed the removal of the polypoid masses, however. After a few weeks' treatment of the nasal fossæ locally, and the administration of ascending doses of potassium iodide and strychnia, his frontal pain was much relieved, the sinus discharge diminished and vision in the left eye rose to ${}^6/_{xv}$ on February 24, 1906, His business affairs then compelled his absence from the city until August, 1906, when he had an attack of rheumatism and a long spell of invalidism. In June, 1907, I found vision had sunk to ${}^1/_{10}$ and the nostrils again stuffed with the polypoid growth. These were again removed, the nostrils treated for a few days, and he was not seen again until November, 1907. The veins and arteries were of normal caliber but had gray lines at their border near the nerve, which disappeared toward the periphery. The outer half of nerve was gray but not cupped and still capillary, but there was an absolute central scotoma and fixation was eccentric. Amputation of the turbinates was again advised but refused. Early in 1908 he went abroad for treatment and reported in December, 1908, that he had been under Prof. Pagenstecker's advice and treatment for five months without benefit and had then gone to the Roman baths. He was entirely blind in both eyes and both optic nerves atrophic. At his first visit, in 1905, I sent him to Dr. C. K. Mills for consultation but no positive evidence of intracranial or central nerve disease was discovered.